

Observations of Phenomena of Jupiter's Satellites at Windsor, New South Wales, in the Year 1890. By John Tebbutt.

Day of Obs.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
July 14	I.	Tr. Ingr.	Ext. contact	8-inch	230	0 17 25	
14	I.	"	Bisection	"	"	0 19 5	0 19
14	I.	"	Int. contact	"	"	0 21 5	
14	I.	Occ. R.	First seen	"	140	23 54 20	
14	I.	"	Bisection	"	"	23 55 24	
14	I.	"	Last contact	"	"	23 56 59	
21	I.	Ecl. D.	Last seen	"	130	23 9 55	23 9 57
22	I.	Tr. Egr.	Int. contact	"	110	22 42 36	
22	I.	"	Bisection	"	"	22 45 46	
22	I.	"	Ext. contact	"	"	22 48 6	
31	II.	Occ. D.	First contact	"	130	21 46 22	
31	II.	"	Bisection	"	"	21 49 26	21 49
Aug. 13	IV.	Tr. Egr.	Bisection	"	110	20 17 52	
13	IV.	"	Ext. contact	"	"	20 21 41	20 26
13	I.	Occ. D.	First contact	"	170	22 54 50	
13	I.	"	Bisection	"	"	22 58 15	22 58
13	I.	"	Last seen	"	"	23 0 4	
14	I.	Tr. Ingr.	Ext. contact	"	130	20 5 52	
14	I.	"	Bisection	"	"	20 7 42	20 6
14	I.	"	Int. contact	"	"	20 10 37	

April 1891.		Phenomena of Jupiter's Satellites.					421
Day of Obs.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
Aug. 14	I.	Tr. Egr.	Int. contact	8-inch	130	22 22 29	22 26
14	I.	"	Bisection	"	"	22 24 34	
14	I.	"	Ext. contact	"	"	22 26 49	
15	I.	Ecl. R.	First seen	"	"	20 7 48	20 7 48
15	I.	"	Full brightness	"	"	20 10 22	
15	III.	"	First seen	"	"	20 46 47	20 47 41
16	II.	Tr. Ingr.	Ext. contact	"	"	21 15 9	
16	II.	"	Bisection	"	"	21 16 34	21 18
16	II.	"	Int. contact	"	"	21 18 44	
21	I.	"	Ext. contact	"	170	21 50 50	21 51
21	I.	"	Bisection	"	"	21 52 54	
21	I.	"	Int. contact	"	"	21 54 49	21 56
21	IV.	Occ. D.	First contact	"	"	21 48 35	
21	IV.	"	Bisection	"	"	21 51 55	22 2 51
21	IV.	"	Last seen	"	"	21 55 24	
22	I.	Ecl. R.	First seen	"	"	22 2 50	22 2 51
22	I.	"	Full brightness	"	"	22 5 1	
23	III.	"	First seen	"	"	0 46 33	0 48 18
23	III.	"	Full brightness	"	"	0 52 53	

Day of Obs.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
Aug. 25	II.	Ecl. R.	First seen	8-inch	170	21 50 53	21 51 28
25	II.	"	Full brightness	"	"	21 53 6	
Sept. 7	I.	"	First seen	"	"	20 22 6	
7	I.	"	Full brightness	"	"	20 24 22	
7	IV.	Ecl. D.	Last seen	"	"	21 24 42	21 28 37
8	II.	Occ. D.	First contact	"	"	22 19 17	
8	II.	"	Bisection	"	"	22 21 22	22 20
8	II.	"	Last seen	"	"	22 23 21	
14	I.	Ecl. R.	First seen	"	"	22 17 15	22 17 17
14	I.	"	Full brightness	"	"	22 20 20	
15	IV.	Tr. Ingr.	Ext. contact	"	"	21 25 26	
15	IV.	"	Bisection	"	"	21 30 25	21 49
15	IV.	"	Int. contact	"	"	21 35 14	
16	III.	Tr. Egr.	Int. contact	"	"	22 27 42	
16	III.	"	Bisection	"	"	22 30 22	22 35
16	III.	"	Ext. contact	"	"	22 35 11	
22	I.	"	Int. contact	"	"	20 9 35	
22	I.	"	Bisection	"	"	20 12 54	20 15
22	I.	"	Ext. contact	"	"	20 15 14	

April 1891.		Phenomena of Jupiter's Satellites.					423	
Day of Obs.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s	
Sept. 26	II.	Ecl. R.	First seen	8-inch	170	21 36 35	21 37	
26	II.	"	Full brightness	"	"	21 40 15		
27	III.	"	First seen	"	"	20 51 28		
27	III.	"	Full brightness	"	"	20 55 45		
28	I.	Occ. D.	First contact	"	"	22 36 32	20 53 56	
28	I.	"	Bisection	"	"	22 38 41		
28	I.	"	Last seen	"	"	22 40 6	22 38	
29	I.	Tr. Egr.	Bisection	"	"	22 3 34		
29	I.	"	Ext. contact	"	"	22 7 18	22 6	
Oct. 4	II.	Ecl. R.	First seen	"	"	0 14 3		
4	II.	"	Full brightness	"	"	0 17 11	0 14 23	
4	III.	Ecl. D.	Began to fade	"	"	21 15 44		
4	III.	"	Last seen	"	"	21 22 25	21 22 48	
5	III.	Ecl. R.	First seen	"	"	0 53 13		
5	III.	"	Full brightness	"	"	0 59 2	0 55 30	
7	I.	"	First seen	"	"	22 32 11		
7	I.	"	Full brightness	"	"	22 34 50	22 32 6	
21	I.	Occ. D.	First contact	"	"	22 44 18		
21	I.	"	Bisection	"	"	22 46 48	22 45	
21	I.	"	Last seen	"	"	22 48 7		

Day of Obs.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
Oct. 22	I.	Tr. Egr.	Int. contact	8-inch	170	22 9 5	
22	I.	"	Bisection	"	"	22 11 59	22 14
22	I.	"	Ext. contact	"	"	22 14 4	
23	I.	Ecl. R.	First seen	"	130	20 51 45	
23	I.	"	Full brightness	"	"	20 55 13	20 51 43
26	II.	Tr. Ingr.	Ext. contact	"	170	21 40 9	
26	II.	"	Bisection	"	"	21 41 54	21 37
26	II.	"	Int. contact	"	"	21 44 23	
28	II.	Ecl. R.	First seen	"	140	21 26 19	21 26 14
28	II.	"	Full brightness	"	"	21 29 49	
30	I.	"	First seen	"	"	22 47 16	
30	I.	"	Full brightness	"	"	22 49 29	22 47 4
Nov. 5	III.	Tr. Ingr.	Ext. contact	4½-inch	180	22 2 45	
5	III.	"	Bisection	"	"	22 4 59	22 2
5	III.	"	Int. contact	"	"	22 8 29	
6	I.	Occ. D.	First contact	8-inch	170	21 5 58	
6	I.	"	Bisection	"	"	21 8 12	21 6
6	I.	"	Last seen	"	"	21 8 37	
13	IV.	Ecl. D.	Last seen	"	140	22 4 20	22 9 49

Remarks.

July 14.—Definition pretty good.

July 21.—Definition pretty good, but images rather tremulous. Satellite disappeared close to the planet's limb, and was very faint for a long time before final extinction. Observation not good.

July 22.—Definition fair and images pretty steady.

July 31.—Definition pretty good, but final disappearance not seen, in consequence of cloud.

August 13.—Definition not good at bisection of IV., but better at external contact; bisection observation certainly late. Bad definition in case of I.; the satellite distinguishable through the planet's edge till almost the time of final disappearance.

August 14.—Definition bad at ingress, and the observation of external contact too late; definition pretty good at egress.

August 15.—Images tremulous at reappearance of I., but more steady and the definition pretty good at that of III. Sky clear. Full brightness of I. unsatisfactory. III. came out nearly in contact with I., and its reappearance could not therefore be accurately observed.

August 16.—Images steady and fair definition.

August 21.—Definition excellent, and observations unusually good.

August 22.—Sky beautifully clear. Images steady, and definition pretty good. Moon present, and observation of first phase rather late.

August 23.—Sky still clear, and definition excellent. Satellite conspicuous at recorded time, and the observation therefore too late.

August 25.—Sky beautifully clear and definition fair, but Moon not far from planet.

September 7.—Sky beautifully clear, but images tremulous and badly defined. IV. disappeared and reappeared several times before final extinction at the recorded time.

September 8.—Good definition. Satellite visible through limb till near final disappearance.

September 14.—Sky clear. Images pretty steady, and definition fair. Satellite suspected 4.5 seconds earlier and distinct at recorded time.

September 15.—Definition fair at first two phases, but much disturbed at the last. Satellite remarkably faint before ingress, and 29 minutes after internal contact it was plainly seen as an elongated dark spot.

September 16.—Images steady and definition excellent.

September 22.—Sky clear and definition good.

September 26.—Sky clear near planet, and definition pretty good.

September 27.—Sky beautifully clear; images steady and definition pretty good. Observation of first phase probably a second late. Full Moon had risen.

September 28.—Definition pretty good, but final disappearance difficult to observe.

September 29.—Bad definition.

October 4.—Sky clear throughout, but images tremulous and badly defined for II., and definition pretty good for III.

October 5.—Sky still clear, but definition not quite so good. Satellite suspected 17.5 seconds earlier.

October 7.—Sky clear and definition pretty good.

October 21.—Bad definition.

October 22.—Bad definition.

October 23.—Sky beautifully clear, and definition pretty good. Satellite suspected three seconds earlier.

October 26.—Fair definition.

October 28.—Sky clear, and images well defined. Satellite suspected 1.5 second earlier.

October 30.—Sky clear, and images steady and well defined.

November 5, 6.—Images steady and well defined, but very difficult to observe the last phase of I.

November 13.—Sky very clear, but definition very bad. Satellite had already faded considerably at 22^h 0^m 55^s. Satellite glimpsed at intervals till the recorded time, and was not afterwards seen.

NOTE.—An occulting bar was not employed in the eclipse observations. The times given in the first and seventh columns are the Windsor mean times of observation, diminished by 10^h 3^m 20^s.5, and entered to the nearest second.

Windsor, N. S. Wales :
1891 February 11.

Ephemeris for Physical Observations of the Moon. By A. Marth.
1891 May 11 to August 31.

Greenwich Noon.	Selenographical Colong. Lat. of the Sun.		Geocentric Libration. Sel. Long. Lat. of the Earth.		Combined Amount.	Direction.
1891. May 11	305°34	−0°43	+5°65	−2°97	6°37	242°2
12	317°57	0°41	5°30	4°26	6°79	231°1
13	329°80	0°38	4°64	5°31	7°04	221°0
14	342°02	0°36	3°73	6°09	7°13	211°3
15	354°24	0°33	°63	6°59	7°09	201°6
16	6°45	0°30	1°41	6°80	6°94	191°7
17	18°66	−0°28	+0°15	−6°72	6°72	181°3
18	30°87	0°25	−1°08	6°34	6°44	170°3
19	43°07	0°22	2°23	5°69	6°11	158°6
20	55°26	0°19	3°24	4°78	5°77	145°9
21	67°45	0°16	4°06	3°63	5°44	131°8
22	79°64	0°13	4°66	2°28	5°19	116°1
23	91°82	0°10	5°02	−0°79	5°08	98°9
24	104°00	−0°07	−5°12	+0°77	5°18	81°4
25	116°19	0°04	4°97	2°32	5°48	64°9
26	128°38	−0°01	4°57	3°77	5°92	50°4
27	140°58	+0°02	3°96	5°01	6°40	38°2
28	152°78	0°05	3°15	5°98	6°76	27°7
29	164°98	0°08	2°20	6°60	6°95	18°4
30	177°29	0°11	1°15	6°81	6°90	9°5
31	189°41	+0°14	−0°04	+6°62	6°62	0°4
June 1	201°64	0°16	+1°06	6°01	6°11	350°0
2	213°88	+0°19	+2°12	+5°04	5°47	337°2
June 10	311°86	+0°37	+3°63	−5°86	6°89	211°7
11	324°10	0°40	2°72	6°45	6°99	202°7
12	336°33	0°42	1°63	6°75	6°95	193°5